

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND TECHNOLOGY RESUME

TITLE

Physical Studies of Small Asteroids and Cometary Cores

PERFORMING ORGANIZATION

Lunar and Planetary Laboratory
University of Arizona
Tucson, AZ 85721

INVESTIGATOR'S NAME

Wieslaw Z. Wisniewski

DESCRIPTION (a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year; c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)

a. Strategy: The main goal of our research is to carry on extensive study of physical properties (colors and variability) of asteroids in the 1-10 km diameter range and of cometary cores, with the use of CCD camera, PMT photometer, or both. Particular attention is paid to asteroids being observed by radar because the greatest gain is found from the combination of radar results with the data obtained by optical techniques.

b. Accomplishments: To satisfy our goal 100 nights/year have been scheduled on the 2.3m and 1.5m telescopes. During the past 2 years 42 small asteroids were observed. Out of 22 asteroids for which periods of rotation could be precisely measured, 17 have periods of rotation less than 5 hours. This indicates that small objects rotate faster indeed. By now we know 14 asteroids with rotation periods in the 2 hours range. At the same time we confirm, the existence of a number of exceptionally slow rotators e.g. 1367 Nongoma with P=5.65 days. Our taxonomic observations lead to a conclusion that Apollo, Amor, and Aten asteroids represent a variety of classes and are not predominantly of class S. Apollo asteroid 3361 Orpheus was found to belong to the rare class V. In collaboration with Dr A. Harris of JPL the opposition effect was studied for 30 Urania and 64 Angelina. Seven comets: P/Helin, P/Brooks 2, P/Klemola, P/Borrelly, Wilson (1986 1) and Shoemaker (1987 o) were monitored for variability. The results were negative with the exception of P/Brooks 2 for which 0.35 mag amplitude was detected.

c. Anticipated Accomplishments: The analysis of the data and comparison with the data already published should lead to better understanding of rotation rates of asteroids and their taxonomic classes as a function of size, type and possibly location.

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d. Publications

Wisniewski, W.Z., and McMillan, R.S.: Differential CCD Photometry of faint asteroids in crowded star fields and non-photometric sky conditions. *Astron. J.*, 93, 1264, 1987.

Wisniewski, W.Z.: Photometry of Six radar Target Asteroids. *Icarus* 70, 566, 1987.

Goebel, J.H., Moss, N., Cohen, M., McCreight, C.R., Witteborn, F.C., Rank, D. and Wisniewski, W.Z.: Narrow Band Imagery in the 8-14 Micron Spectral Region. *Proc. SPIE*. 686, 114, 1987.

Wisniewski, W.Z.: Optical Ground Support for Space, Radio and Large Optical Telescopes. *Proc of the Strasbourg Colloquium on "The Coordination of Astronomical Projects"*. Ed. C. Sterken. Cambridge Univ. Press. (in Press).